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CALCULATING THE CARBON FOOTPRINT: IMPLICATIONS FORGOVERNING

EMISSIONS AND GENDER RELATIONS

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CALCULATING CARBON FOOTPRINT: IMPLICATIONS FORGOVERNING EMISSIONS AND GENDER RELATIONS

Abstract:

In this article, we use fresh empirical evidence,and draw on feminist and critical accounting and organisational theories tocontend that carbon calculators can be interpreted as discriminatory control technologies. They do this by providing a new and flexible vocabulary for governing expenses, costs and investments at a distance, avoiding a sense of direct intervention by the government. Thus, given our stance that the carbon calculator cannot be considered a neutral tool, we argue that it has the potential to control personal responsibilities regarding both environmentaland family-based issues.

Key words: Carbon Calculator/Footprint, Accountability, Critical Analysis and Gender.

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Highlights:

- Examination of a particularcarbon calculator introduced by the British Government.
- Analysis of the Act on CO_2 calculatoras a genderedhousehold accounting technology.
- Exploration of householders'accountability in attempts to reduce personal footprint.
- Analysis of footprint technologies as tools for changing householders' lifestyles.

CALCULATING THE CARBON FOOTPRINT: IMPLICATIONS FORGOVERNING EMISSIONS AND GENDER RELATIONS

1. Introduction

This article focuses on apersonal carbon calculator,a tool that allow individuals and householders to understand, monitor and receive feedback on their personal emissions/carbon footprint(Bottrill, 2007).Carbon mensuration was also identified as a means of motivating environmental efficiency and cost reductions at the household level (Pandey, Agrawal, & Pandey, 2011). There is a variety of calculators available at national and international levels (Bottrill, 2007), these having been developed by different organizations including governments, commercial companies and media groups (Paterson & Stripple, 2010).

However, there are important considerations to be made while studying the personal carbon footprint in the household context. According to Nye et al.(2010), technologies used to make visible householders' impacts on the environment may affect consumers' routines and lifestyles. These techniques not only inform on the amount of emissions but also provide data on costs related to emissions' consumption (Nye, et al., 2010). However,there is only limited data on how domestic actors experience the agenda of behaviour change geared towards emissions reductions (Nye, et al., 2010), and their impact on rules and behaviours inherent to daily life (Nye, et al., 2010). Moreover, while carbon footprintmeasurement facilitates calculative

estimations,it fails to offer a complete and accurate amount of the actual emissions incurred.

Carbon footprint technology is still evolving, especially with regard to the accuracy of estimations and transparency of calculations methods, as a means of benchmarking and comparison (Padgett, Steinemann, Clarke, & Vandenbergh, 2008). Hence, there is a need to explore, in more detail, the consequences of personal choices before setting a normative concept of responsible behaviour towards emissions reductions (Whitmarsh & O'Neill, 2010).

Ourstudy exploresthe application of a particularcarbon calculator: the Act on CO_2 calculator[1]through the lenses of 'governmentality' and the 'governable person', as an accounting technology that influences householders' lifestyles. In summary, we found that the use of this specific calculator suggests its capacity for the control of householders' emissions at distance. Our study also illustrates how calculative tools,such as Act on CO_2, when used in a household context, may impact on our understanding of gender relations.

The article is structured as follows.Section 2 examines the relevant literature as ameans of exploring the use of the calculator through the lenses of governmentalityand the governable person and with attention to the gendered nature of technologies. Section 3 presents detail on the UK's Act on CO_2initiative within its political social and economic context. Sections 4 and 5 will present the methods used in our studyand our findingsrespectively. More specifically, in those two sections, we

examine both primary and secondary data analysing people's carbon related behaviours and time use, and specifically people's use of the Act on CO_2calculator.

We address the secondary data first as a means of providing a context for the analysis of our own empirical work. Our examination of secondary data is two-stranded, firstdrawing on Lader, Shor & Gurshuny's (2006) Time Use Survey; and secondly by looking at extracts from diaries compiled by 29 participants in a 15 weeks emissions trial, the People Power Challenge, promoted by the Government following the launch of the Act on CO_2 Campaign in three different UK cities: Newcastle, Birmingham and Portsmouth[2]. Our primary data, gathered*via* semi-structured interviews with a sample of Scottish families involving 13 participants in total,explores their views on using the calculator. Finally, in Section 6, we present our concluding remarks.

2. **TheLiterature:Visibility, calculation and control**

Miller and Rose(1990) built on the concept of governmentality proposed by Foucault (1979), as a means of analyzing techniques that were used by Governments to control individuals' conduct in order to achieve a political objective. As Taylor (1996)has pointed out, such techniques:

> *'[are] part of technologies of control. It is at the hinge where two axes of such developmentjoin.On one hand, it is related to the disciplines of the body; on the other, to the regulation of populations. It serves the preservation and extension*

of life as the 'bio-mass', which is the over-riding direction of much modern policy.'

Thus, measures of identifyingpersonal failure are essential. In this scenario, the development of a discourse to represent Government objectives, as well as providing a mechanism for rendering visible the activities and behaviours of individuals (or groups) as a means of better identifying shortcomings regarding behaviours or outputs, is vital.

Several studies haveused the notion of governmentality to analyse policies and practices to tackle climate change(Lövbrand & Stripple, 2011; Lovell & MacKenzie, 2011; Methmann, 2011; Oels, 2005; Paterson & Stripple, 2010). Paterson and Stripple (2010)analyzed five practices to tackle climate change: Carbon Footprint, Carbon Dieting, Carbon Reduction Action Groups and Personal Carbon Allowances. They concluded that these practices governed individuals at a distance and 'shaped individual subjects' by making them manage their own emissions and 'modeling' practices, behaviors and identities (p.359); in other words, those people became socialized/indoctrinated by the techniques, or technologies, to which they were exposed.

The notion of thegovernable person suggested by Miller and O'Leary(1987), drawing on the principles of power and knowledge suggested by Foucault (1970), is another important concept forapplication in our argument. Miller and O'Leary(1987)locate

accounting, particularlystandard costing and budgeting (SC&B), among a set of calculative techniques that can be used at the level of society. More specifically, they described accounting as providing a set of norms and standards, necessary to adhere to, for successful use of resources.Furthermore, they argued that because of its abilityin the wider social context to render visible individuals' inefficiencies,accounting is not a 'neutral process'(Miller & O'Leary, 1987).

Forms of accounting control have evolved over time. The literature explains these changes by illustrating, for example, the fact that the workplace is a space for shaping human relations (Miller & Rose, 1995), and also because workers' identities have been influenced by social, political and historical contexts (Bhimani, 1994). Thus, the language, vocabulary and techniques of SC&B form means of control over personal responsibilities without the need for direct intervention (Miller & O'Leary, 1994a).

The work of Miller and O'Leary(1994a)was criticized for its focus on the analysis of production and the diffusion of accounting technologies, leaving apart variables such as class, ideology and social structure within the organizational context (Arnold, 1998; Froud, Williams, Haslam, Johal, & Williams, 1998). Arnold (1998) arguesthat accounting technologies are social practices representing symbolic rationalisations, suggesting as relevant the use of Thompson's three-part methodology in order to understand these symbolic constructions. CertainlyThompson's three-part methodology involvesa more holistic approach by including different perspectives, as follows:(i) analysis of production and diffusion of accounting technologies; (ii) studying

the construction of these technologies by exploring how they are embedded in the political context, and (iii) examining the reception of the technologies by analyzing how symbolic constructions are received and appropriated by individuals(Thompson, 1990).

Notions of governmentality and the governable person are useful to understand household accounting techniques. This is mainlybecause household accounting techniques have been criticized for the contrasting tendency of making invisible the importance of expenses (Laslett & Brenner, 1989)in regard to social reproduction(Laslett & Brenner, 1989)[3]. Analysts such as Hartmann (1981), engaged with the problematics of this concept, which essentially places women in the double bind of capitalism and patriarchy.

More specifically, the household accounting literature addresses the impact ofaccounting techniques on women's lifestyles (Llewellyn & Walker, 2000; Walker, 1998, 2003, 2008; Walker & Carnegie, 2007; Walker & Llewellyn, 2000). Thus, we can see that accounting techniques have been seen toinfluence different aspects in the context of the household, for example: access to the public domain; decision making; distribution of householders' responsibilities; and household economic contributions and opportunities for skill development and use.

During the Nineteenth Century, household accounting practices in Britain enabled considerable control over private daily life. As a resultbetter appreciation of the (gendered) domains of extensive housekeeping routines, was developed, thereby

enshrining gendered expectations of responsibilities(Walker, 1998). Elsewhere, budgeting techniques were found to impact upon the expenditure decisions of Australian women (Walker & Carnegie, 2007). During the First World War, moral consciousness was shaped by the use of private money in order to recover the national economy. In common with the UK, while men brought money into the household through their paid employment, women were responsible for the management of the household finances (Carnegie & Walker, 2007).

At the beginning of the Twentieth Century, accounting techniques, such as budgeting and cost accounting, seem to have been used to inform contributions within the British household; thereby governing costs and making visible who was responsible for expenses and savings (Walker, 2003), and where they failed. During the interwar years, authorities motivated women to incorporate notions of 'costing' and 'time and motion'in the household context in order to control materials and energy for the national purposes of eliminating waste and maximizing benefits during the reconstruction period(Walker, 2003). Moreover, given the diversity of accounting techniques required, the idea that women should perform such tasks in the private domain,thereby excluding the possibility of their professionalization and employment externally, was reinforced(Walker, 2003).

In considering the concepts central to the literature on governmentality and the household, discussed above, we are referring to the extent to which the use of instruments such as the Act on CO_2 calculator can be seen as tools for and mechanisms

of governmentality. It is our contention that such instruments are essentially accounting technologies that render visible those tasked with making use of them thereby making them governable. Because of the preponderance of focus on tasks most closely linked with issues of social reproduction,as will be seen, it is our view that the instrument, and the outcome of its use, is gendered.

Returning to the issue of the control of emissions within the private domain, skills and commitment to calculate carbon footprint, and then set targets to remedy emissions, are required. One of our aims is to examine the extent to which such involvement is gendered.Theskills required in achieving the goals defined in carbon calculation arguablymatch those associated with the accounting techniques of cost accounting and budgeting respectively. We have drawn theoretically on the concept of 'economic citizenship', a concept typified by the mutual dependence of capitalism and the class system(Marshall, 1998), and therefore the circularity of outcomes; and we have extended from that to incorporate Kessler-Harris's (2003)interpretation. In doing that, we make the argument that women's roles within capitalism and patriarchy have limited the women's influence in society. Our theorization is applied to our examinationof the carbon footprint, in which householders become informed of inefficiencies andresponsible for improving processes.

The control of emissions in the private domain is time consuming and requires lifestyle changes, and research has suggested that women perform the lion's share of control in this regard. Drawing on their qualitative research, Judkins and Presser (2008)

demonstrated that women are more likely to perform eco-friendly household work than their husbands/male partners. Moreover, Ergas & York(2012:965)suggested there is a need to promote gender equality in the public domain because there is a positive relationship between 'women's political status and CO_2 emissions *per capita*'.

In conducting our research, our objectives are relevant for three main reasons. First, to identify the key characteristics of policies and practices to tackle climate change that can govern individual decisions at distance. Second, the notion of gender relations is not a concept regularly explored by scientific studies about climate change (Arora-Jonsson, 2011; Ergas & York, 2012; MacGregor, 2010). Third, in applying concepts of 'economic citizenship',in association with Thompson's (1990)three-part methodology, for the specific case of the carbon footprint within the household setting, we seek to better explain the gendered nature of such citizenship in the context of the carbon footprint.

The literature reviewed above leads us to argue that the carbon footprint, launched as it was in a mass communication (Thomson, 1990),can be interpreted an ideological technique to render visible and measurable personal activities, creating the power to set personal responsibilities and control individuals' inefficiencies. However, we seek to contribute to the previous literature by taking into account suggestions made by Arnold (1998). Thus, we seek not only analyse the diffusion of the carbon footprint technique, but also to explore the construction of such techniques within a political context. More specifically, we contend that governments can and do make use of

accounting technologies in an attempt to control and influence personal lives. We move on now to describe the calculator and, through discussion of associated literature, we relate it to the concept of governable person.

3The Act on CO_2 calculator

Our article explores the use of a specific footprint calculator, the Act on CO_2 calculator (hereafter 'the calculator'). This section outlines the social, political and economic contexts in which the calculator was set,as well asproviding a brief explanation on the different parts of this specific calculator, relating them as the basis for building up an accounting technology.

3. 1 Societal, political and economic contexts

The Labour Governmentlaunched the Act onCO_2campaign in 2007[4] in a national communication initiative to heighten public awareness of the impact of climate change and the need for the remodeling of behaviour to address such change.The campaign compriseddifferent components: advertisements (TV, press, radio and online), a webpage, the People Power challenge and a calculator[5]. The government webpage describe this campaign as:

> *'…a cross-Government initiative, currently involving the Department of Energy and Climate Change (DECC), the Department for Transport (DfT) and Department for Environment Food and Rural Affairs*

(DEFRA)…[demonstrating] the Government's commitment to taking action on climate change, working with businesses and individuals in order to reduce CO_2 emissions.'[6]

The advertisement phase of this campaign was strongly criticizedby the public. This was mostly because it contained 'bedtime stories' that were deemed too frightening forchildren(Corner & Randall, 2011). They also received criticism from climate change communication experts who contended that they usedunsupported information on the causes of climate change(Corner & Randall, 2011). As a result, the Advertising Standards Authority (ASA) banned the advertisements[7].

In comparison to the advertisements, the carbon calculator seemed to presenta more acceptable component of the Act on CO_2 campaign[8]. The calculator was 'marketed'as a voluntary tool allowing individuals to estimate their personal carbon footprint. It was designed not only to educate the public on their footprint, but also to providenational official information. This approach allowed individuals to compare their footprint to national levels and set a personal plan, if appropriate(DECC, 2009; Owen & Beevor, 2009); and also to make their carbon use visible.

The People Power Challenge was another component ofthis campaign, involvinga trial in which participants would take actions to reduce energy. Participants were expected to trialperiodically their carbon footprint, using the calculator, and to write online diaries of their experiences. The People Power

Challenge was introducedto support the Climate Change, Energy, and Planning Bills[9]. Important objectives of these Billswere:[10] (i) the transition to a low carbon economy, (ii) secure long term energy supply, and (iii) to set a legally binding target to achieve 80% emissions reductions by 2050 considering 1990 emissions levels. Hilary Been, the UK Secretary of State for the Environment,described People Power Challenge as aiming to:[11]

> *'… show people how they can save energy in their homes and on the road so saving money and helping the fight against climate change. We all have a responsibility for the future of the environment, and in these tough economic times we can all benefit by thinking carefully about using energy.'*

Thus, it is possible to suggestthat the intention of the government was to motivateindividuals to participate in the trial voluntarily,using the lures of saving money *and* energy and, *via* the latter, play a part in saving the world. This discourse could be explained by the difficult times endured during and after the credit crunch/recession in 2008/09. In this context, saving money could be also interpreted as an opportunity to save energy and tackle climate change. It is difficult to ascertain that the economic crisis had an impact on households' emissionsreductions because, for example, the UK emissions generated directly by households remained at similar levels from 1997 until 2012 (DEFRA, 2015). However, the fact that households'

emissions presented at similar levels over that time does not necessarily mean that the dynamics on how to use and allocate households' resources did not change.

While the Government did not explicitly target particular groups of households for involvement in the Act on CO_2 calculator and People Power Challenge,it is possible to infer that participants in these initiatives needed to have access to the Internet, as well as the competenceto operate it. In 2009, the percentage of British householdswithInternet access was 61% rising to 77% in 2011(OfficeforNationalStatistics, 2013)[12], so clearly, not all households had such access.Participation in the PeoplePower Challenge and Act on CO_2 calculator was voluntary and individuals were recruited using different media. For example, Newcastle City Council announced the participants' recruitment to People Power Challenge in the online news[13]. 'Qualified' participants were guided to calculate their carbon footprint using the online calculator.

In 2010, the Conservative-Liberal Democrat coalition took thepower of the UK Government from the Labour Party.Thispolitical shift sawthe Carbon Plan, established by the Coalition Government,being published in December 2011 (HMGovernment, 2011). The Act on CO_2 campaign was active until 2012 when the fund for this initiative ended. Despite the fact that the Act on CO_2 calculator is no longer available, exploring it from agovernmentality perspective, andin the light of Thompson's (1990) theorization, it can be considered a tool of mass communication to both drive and

measure behavior change, in much the same way as SC&B can be seen (Miller and O'Leary, 1987).

We move on now to examine our own premise that the Act on CO_2calculator is an accounting technology.

3.2 The Act on CO_2 calculator: An accounting technology?

The calculator began by asking if the user would like to calculate an individual or family carbon footprint. On calculating the carbon footprint for a family, the calculator was divided into three sections: calculator, footprint and your plan. Each of these parts will be described below.

In the 'calculator' section, there were questions on the home as a building, as well as the household use of appliances and travel. These questions were separated into several topics: the home, heating, lighting, kitchen and entertainment. The user was then invited to study their appliances and vehicles, as well as other transportation uses or requirements such as flights.

The second part of the calculator presented an estimation of a family's emissions level, while also providing a benchmark by comparing a specific family footprint with that of the UK average emissions per family. Finally, the total of emission was 'translated'into other measures. For example, the user was asked: how many cups of tea and party balloons could the user get with theirfamily emissions; the intention being that

families would reassess (and arguably change) the way in which their ‘spent’ their emissions.

The third part advised individuals on how to reduce personal emissions by encouraging them to make a reduction plan. Three different types of plan were suggested: easiest to do, best value for money and saving most CO_2. Decisions were taken based on the segregation of household emissions in the home and on appliances and travel.

In our view, the description of the calculator presented above suggests close similarities with the concept of the ‘governable person’positedby Miller and O'Leary (1987). Within their analysis of SC&Bwere questions on the appropriate use of resources (Miller & O'Leary, 1987). In addition, costing and budgeting made visible the inefficiencies associated with particular individuals. The recognition and measurement of inefficiencies in monetary terms may impose on individuals a sense of responsibility (Miller & O'Leary, 1987), without the need of direct intervention (Miller & O’Leary, 1994a, 1994b). This outcome is because inefficiencies, and their perpetrator(s), could be madeso obviously visible; thus,the calculator can be seen as facilitatingjudgment(Miller & O'Leary, 1987), or, as Foucault put it, ‘the disciplinary gaze’(1975).

It isalso possible to suggest more broadlythecalculator asa technology ofall-encompassing governmentality (Miller & Rose, 1990). Drawing once more on

Foucault(2000), we suggest that introduction of the calculator ably constituted the implementation of a technology of self, in which people can be seen to self-monitor, thus,as part of the "bio-mass", they are constituting self-governance. In his conceptualization, Foucault(2000)recognised the paradoxical role of society in relation to government; the latter constantly intervening in the activities of the former, which government is established to serve.It is our contentionthat tools designed to calculate emissions use a specific language/vocabulary(Thompson, 1990)that renders visible activities within the household context, thereby opening a space for self-evaluation, comparisons with peers and self-management(Graham & Neu, 2004; Miller & Rose, 1990).

We move next to our discussion of our research materials and the methods used for the study.

4. Material, methodology and methods

4.1 Research methodology and objectives

It is not our intention to provide results of a survey based on sampling of a population. We want to provide valuable insight to this area of study in regard to our argument that the calculator is an accounting technology, which also has the potential to be a gendered tool. Thus, our research aims, methodologically, to engage in a qualitative, interpretive, in-depth inquiry(Fearfull, 2005)of the dynamic qualities of householders' lifestyles(Crouch & McKenzie, 2006).By focusing on the calculator and its outcomes, we consider the practical aspects of life, inferences on personal experiences, personal knowledge and understanding of the participants' routines (Small, 2009).As a means

of further contextualizing our empirical data, an explanation of the secondary data analyzed in this article is now provided.

4.2 Method 1: Analysis of Secondary data:The Time Use Survey and The People Power Challenge

Our analysis includesengagement with two secondary sources from other studies conducted in the UK. The first isLader, Shor, & Gershuny's (2006)report:The Time Use Survey (TUS). Our examination of the TUS, presented in section 5.1 below, helps to identify which aspects of personal lifestyles may be affected by actions taken to reduce emissions in UK household context. That report provided valuable insight to the actions taken by our own participants whose role in our study is examined in 5.3 below.

The second such source[14] is a 15-week emissions trial conducted in 2009 as part of the UK Government's Act on CO_2 Campaign. That trial was referred to asThe People Power Challenge (PPC) and involved 29 participants. Thus, in section 5.2 below, we have engaged with the content of the Government's PPC reportas a means of identifyingpatterns of behavior of the individuals usingthe calculator during an extended period of time[15]. Engaging with this study provided insight to the Government's objectives on launching the Act on CO_2 calculator. Even the name of their trial: The People Power Challenge - reminiscent of Foucault's concept of "bio-power/bio-mass outlined above (Taylor 1996) -is indicative of the government's intention to make personal the responsibility for carbon use and production.

4.3 Method 2: Analysis of Primary data

We also present and analyse empirical evidence based on case studies in which families made use of the calculator. The appropriate numbers and selection of observations to consider in quantitative and qualitative research have been well discussed in the literature (Buckler, 2008; Crouch & McKenzie, 2006; M. Mason, 2010; Small, 2008, 2009), and not all proponents agree in terms of meaning and usage. Small (2009) argues that qualitative research tends to imitate the grounded language from classical statistics whereby representation of a sample in a population, probabilities and errors are expressions commonly encouraged. However, this does not fit all kinds of research, especially those based on answering the 'how' and 'why' questions(Small, 2008, 2009). Consequently, there is a need for a deeper approach that is not confined bysuperficial description using numerical interpretations (Small, 2008, 2009).

The primary data used in this paperinvolved a qualitative, inductive methodology through which semi-structured, face-to-face, group interviews arranged with five different groups (cases),including couples and two-parent families with children aged from 11 - 17 years[16], were conducted. Overall, 13 people were interviewed: five females, five males, two adolescent males and one adolescent female. All interviews took placein 2011 in Glasgow, Scotland, and were facilitated by the first-named author.

Validity of the case study method is based on an inquiry in which the researcher makes logical links between characteristics in an explanatory schema and not across a sample of a population (Small, 2009:22). In suchcases, random selection may not be the most effective way to select cases and snow-balling might be an alternative (Mason, 1996; Small, 2009). Also in this sort of research, saturation[17] is a recognised concept to infer sufficient numbers of cases to consider(Saumure & Given, 2008; Strauss & Corbin, 1990). In certain types of research, saturation may be achieved at a very early stage and, large numbers of respondents may be considered counter-productive (M. Mason, 2010).

In our research, respondents were selected by a snowballing approach (Mason 1996) and saturation was a function of the households' contexts, both internally within each household, and taking into account comparison of findings between the participating households. We analyzed diverse contexts in which family groups had different profiles in terms of the number and personal features of the people living together, including: Gender, age of participants, participants' backgrounds and views on anthropogenic climate change. These characteristics are detailed in Table 1[18].

Table 1 to go about here

The interviews were extensiveand conducted by the first named author, each taking between 60-90 minutes; they were audio-recorded and transcribed.

Supplementary notes were also taken during and after all interviews. The interviews took place in participants' homes in order to observe the main context in which they make their decisions regarding the household carbon footprint, and to better understand how daily actions were performed (Skill, 2008).

The interviews also had two stages:the preliminary stage began with an introduction defining climate change, followed by the gathering of participants' biographic details. Using questions based on an adaptation of Skill's (2008) interview schedule to include areas related to the use of footprint calculator, this stage progressed to asking participants general questions on their responsibilities towards the environment. After this preliminary approach, all participating household members began, at the same time, to work on the calculator. A follow-upor second stage, interview was carried out later on the same day with general questions on the participants' views on their experiencesofusing the calculator.

In writing up our findings,in order to preserve participants' anonymities, we have not disclosed their names, nor have we used pseudonymous.

We now engage with our primary and secondary data.

5. Data analysis

In this section, we begin, in Section 5.1, with an analysis of the first oftwo secondary data sources, a diary survey of time use conducted by Lader et al. (2006). We move on

then, in Section 5.2, to analyse the data from a UK government sponsored 15-week carbon trial (section 5.2). In Section 5.3, we engage with our own data gathered through family-based interviews.

5.1 Energy consumption in UK households: the TUS survey (2006)

According to Gershuny(2011), time diaries are powerful tools to gain understanding of personal well-being, because they provide detailed information on how much time individuals spend on a sequence of activities. Thus, analyzing time diaries allows us to understand patterns of daily activities and their duration.

From the diary content ofLader, et al.(2006),UK conductedTUS survey,and as Graphic 1 shows,we learned that females spent 78% more time each day doing domestic taskswhen compared to males (178 minutes: 100 minutes). This scenario was still evident when considering time spent in domestic tasks by full time workers only. In this case, females spent 151 minutes a day on domestic task compared to 113 minutes spent by males. Conversely, malesspent more time on paid workthan did women (211 minutes:132 minutes).

Graphic 1 to go about here

Graphic 2 shows howresponsibilities in the UK household context differ by gender. Females spent more time cooking, washing up, cleaning, tiding, washing clothes, shopping, attending appointments with their children and looking after pets than did

males, for whom the only category of household work in which they exceeded women was household repairs and gardening(Lader, et al., 2006). From Graphic 2 it can be seen that the time spent on such tasks by males and females together was significantly less than that spent by females alone on cooking and washing up(Lader, et al., 2006).

Graphic 2 to go about here

Graphic 3 shows that this pattern does not change when considering women and men, both of whom work full time (Lader, et al., 2006). We can also see herethat women are the main users of both 'wetappliances'(e.g. washing machine, wash-dryer, dishwasher and tumble dryer)and 'cold appliances'(e.g. chest freezer, fridge-freezer, refrigerator and upright freezer). As we note in the following paragraph, that observation allows us to draw out another aspect of gendering and a further means by which women can be rendered more visible and accountable in regard to energy consumption and associated carbon emission. According to the DECC (2012), UK household energy consumption regarding wet appliances has increased by 23% in comparisonto 1990 levels. However, energy use related to cold appliance had decreased by 19% in comparison with 1990 levels (DECC, 2012).

Graphic3 to go about here

Men and womenin the UK also showed different patterns regarding travel. Mentending to use the private car slightly more (57 minutes) when compared to

women(48 minutes) (Lader, et al., 2006);menspending more time in the car traveling to paid work than women(Lader, et al., 2006). On the other hand, womenuse the car more in completion of domestic household tasks, such as shopping (Lader, et al., 2006). Our own data allows us to make further commentary on comparative attitudes in this regard as will be seen in Section 5.3 below.

In terms of leisure activities, menmake more use of associated technologies, such as TV, video/DVD, radio and music (170 minutes) than women(145 minutes)(Lader, et al., 2006). According to Gershuny(2011), only 10.7% of womenin the UK use a home computer as compared to 20.3% ofmen. However, UK household energy consumption,specifically regarding consumer electronics and home computing has increased 74% and 356% respectively since 1990(DECC, 2012).

According to the DECC (2012), the most significant percentages of energy consumption within UK householdsrelate to heating spaces (60%), and water (19%), lighting and appliances (19%) and cooking (3%). Thus, taking into account the data from Lader et al.'s (2006)study, in combination with that of the DECC, promoting emissions reductions within theUK household context will affect not only domestic tasks but also leisure activities.

Again, considering the two sets of secondary data outlinedabove, it can be argued that thelifestyles of women,in termsof housework activities,wouldbe more significantly affectedthan those ofmenif changes were required regarding space and water

heating, and the use of appliances and cooking. This is due to the fact that, in the UK,womenare the ones that spend more hours engaged in houseworkthan do men.

We now turn to an analysis of the data gathered in the 15-week emissions trial study promoted through the UK government's the Acton CO_2Campaign in 2009.

5.2 Analysis of a15 weeks emissions trial: the Act on CO_2 campaign – People Power Challenge

ThePPC trial was carried out during December, January and February 2009, in the period of the 2008/9 "credit crunch",in three different UK cities: Newcastle, Birmingham and Portsmouth. Over the15-week period, participants set objectives to improve emissions levels, received experts' advice on energy savings, calculated emissions periodically and produced an online diary. Table 2presents participants' characteristics in terms of age and gender. There were a total of 29 participants, including 13 men and 16 women.

Table 2 to go about here

Table 3 indicates thepriorities expressed by menand womenparticipants in regard to their energy consumption. The most frequent actions taken by both sexes to reduce emissions at household context were as follows: learning driving techniques, turning off appliances at the wall and taking better insulation measures.

Table 3 to go about here

Nevertheless, it can be seen that womenwere consistently more likely to take those actions.While fourmen suggested that clothes should be washed at lower temperatures, no woman made such a suggestion;of interest here is the lack of time that men actually spend on that activity, as seen in the research discussed earlier. We could interpret thisfinding as an initial indicator of control.

Table 4 indicates the motivations for participants to be involved in the trial. Compared to male participants, a higher percentage of women decided to take part foreconomic and environmental reasons. A higher percentage of male participants stressed environmental reasons only. The fact that women were more concerned with both economic and environmental reasons can exemplify responsibilities that they perceived themselves to have within the private domain in times of crisis (e.g. economic crunch, when the trial took place) (Walker, 2003).

Table 4 to go about here

However, arguably influenced by the rigors being imposed through the credit crunch, the femaleparticipants expressed wanting to cut down on energy bills in addition to helping the environment. Some of the ideas they had for achieving this included time regulating their heating, changing to energy saving light bulbs, attending to water leaks, using their own bags when shopping and learning and practicing smarter driving techniques.

As already mentioned, these participants produced on-line diaries. Through these diaries, inefficiencies at the household level became more evident. The process can thus be seen to have led participants toidentify some of their inefficiencies making them more self-vigilant or, we might say, self-disciplinary. Indeed, some participants mentioned beginning to assert self-control at all times and the process was even mentioned as leading to 'compulsive' practice.

Moreover, the feeling of responsiveness apparently exceeded the individual contextas participants recorded exerting controlover other members of the family. Individuals showed their feelings of responsiveness and/or guilt for inefficiencies produced by others:

> *'Our usage went up this week and that's probably because, as we are teachers, we have been at home a lot because it's half term! I also had the 13 year old off school playing games on his games machine and using his laptop a lot, not to mention nephews and nieces visiting; so it all makes a difference and it is interesting to see how much energy usage changes because of events like this.'*(PPC Participant 25, Female)

This extract chimes with Miller and O'Leary's (1994a, 1994b)argument,thatthe technique of accounting, or we might say of the need to provide an account,is a powerful tool that makes visible individuals' relationships with others as well as

highlighting the notion of accountability – who it is that is causing 'the problem' of increased energy use.

In the following section we provide a deeper reflection on the use of the calculator by analyzing our own primary data gathered through conducting interviews as outlined in section 3.2 above.

5.3 Analysis of primary research: Exploring perceptions of the Act on CO_2 calculator

Our analysis of our primary dataengages more deeply with the question of the extent to which the carbon calculatorcan be considered an accounting technology. In particular, we extend our earlier discussion (Section 3.2) to explore whether the carbon calculator is perceived as a tool of 'governmentality'. Our analysis now goes further by questioning how decisions in terms of energy use, appliances and travel, are made in the household context and whetherthe calculator influences household lifestyles. Finally, we illustrate how limitations of the calculator may underestimate carbon reductions.

The next section explores the reasons behind the use of the resources (e.g. individual vs. collective benefits); and analyses how actions to reduce emissions can affect males and females differently (e.g. private vs. external domain; paid vs. unpaid tasks).

5.3.1 To what extent is the calculator an accounting technology?

Our interviewees perceived the calculator as providing a new form of measurementfacilitating analysis of their performance regarding the use of carbon generating resourcesin the household context. From the following it can be seen that the calculator was recognised as a tool for 'translations':

> *'Well, it's interesting, the translation of things into other, you know, things, like […] your footprint is this and […] like I've had that light bulb on for 22 years, that's interesting, so it makes you think about things in a different way'* (Interviewee 4, male).

It seems that the calculator made the notion of the footprint more understandable while using a metric (or vocabulary) familiar to the users. In the language of Miller and O'Leary(1987), we can interpret this as the calculator rendering inefficiencies visible.

The notion of thinking in a 'different way', mentioned above, was elaborated further by other interviewees. They explained how the information they received from the calculator made them reflect on behaviour change. Interviewees captured a notion of themselves as being 'good or bad', and they also felt responsible for achieving similar targets as their peers:

> *'Well, it gives you a notion, it gives you a sort of scale to work with, if you're good or bad or where you are.'* (Interviewee 2, male)

> '*[it] tells you how to go about changing it' (Adolescent)*

Moreover, all interviewees identified a link between the calculator and household/money management. From our interviewees' perspectives, actions to reduce emissions (DECC, 2011), were primarily a serendipitous outcome of household requirement. Using three scenarios, the calculator offers techniques to build an emissions reduction plan: 'easiest to do', 'best value for money', and 'saving most CO_2'. Our participant households were more likely to choose the 'best value for money' option. This result can also suggest some impact of the credit crunch in households' decision while stressing on the possibility of saving money.Thus, the calculator allowed usersnot only toidentify their own inefficienciesas well as those of others; it also provided advice on possibilities for behaviour change. The calculator seemed to establish parameters of decision-making, leading us to question the use of the calculator as part of a'neutral process'(Miller & O'Leary, 1987).

According to Miller and Rose(1990), accounting techniquesprovide a language or vocabulary to shift perspectives on the world around us.Miller and O'Leary(1994a, 1994b)notedthat changes in control using accounting techniques were used to achieve national objectives. Accounting techniques arealso applied as waysof exerting disembodied control, or control at distance, without direct intervention; hence the creation of the governable person(Foucault, 1975). Our empirical evidence demonstrates that the calculatorwas capable of similar effects. Itguided the users towards making reductions in household and personal carbon emissionswhilecausing them to reflect onthe national footprint average.

Thus, the language,introduced and implemented(Thompson, 1990)through the calculator, is capable of guiding users to understand that there might be a need for reductions when they compare themselves within their own household or withwhat is recorded as the national average.

In the next section, continuing to draw on our own empirical evidence, we discuss of how the calculator can influence household lifestyles. Particular emphasis is placed on the different roles played by males and females in the household context. The allocation of personal resources and the management of personal expenses, costs and investments, are two inter-related issues explored here. Such costs are incurred to perform daily household activities and we are interested in how the requirement for emissions reductions may affect that situation and the people involved.

5.3.2The impact of the calculatoron household lifestyles

As we have seen, the calculator segregates household activities into three areas: home, appliances and travel. This classification canbe associated with both private and public domains. Since females remain most active in the private domain, the calculator is likely to demonstrate explicitly the segregation of activities. In this section, we draw more closely on the interrelated notions of gender and governmentality consistent with the theorisations ofHartmann (1981) Kessler-Harris (2003) and Laslett and Brenner (1989).

During the interviews, while completing the calculator, male and female participants were observed to have different responsibilities. In general, females answered most of the questions related to energy use and appliances, while men were more familiar with the use of the car. These results were in line with the works of Skill(2008) and Johnsson-Latham(2006).Two women interviewee explained how theymanaged without the car for shopping,while explaining theirneed to use it in some specific leisure circumstances:

> *'… I've got things to carry and things to do, I prefer the car, but I don't mind walking and public transport if I need to but first choice is probably the car just because I usually have a wee one [a child] with me, so it's easier for me to have a car rather than try and carry her.'* (Interviewee 13, adult female)

> *'I would walk to the shops and actually take the pushchair.'* (Interviewee 6, adult female)

These narratives indicate how women,without a car, can perform a dual family oriented role,in both shopping for the family and looking after a young child,synonymously. It was interesting to hear a male participant's perceptions on the family car use, associating it with both work and family leisure.

> *'That's a business motor and a family motor, that [type of car] I've got. Do I get a tick for that? My car is for work and for family leisure.'* (Interviewee 2, adult male)

We would interpret these contributions as supporting our argument that women could be more susceptible to projects of governmentality, that such governmentality stems fromthe double bind of capitalism and patriarchy (Hartmann 1981), and that they have developed a disciplinary technology of self (Foucault 2000), as discussed above.

Adding to the "problem" for women is the fact that, over several generations, technological and economic changes have, ostensibly, made the homemaking and housekeeping, i.e. social reproduction, both less physical and less time-consuming(e.g. Cockburn, 1985; Cockburn & Ormrod, 1993; Walby, 1986). Intervieweesin our study mentioned the essential nature of 'white' appliances for the daily activities conducted for the benefit of all members of the household. This pattern wasparticularly evident with female participants. The following narratives provide insight to the nature of discussions with participants around their use of household technologies/appliances in the light of the calculator:

> *'…household appliances…we have a dishwasher which is my new best friend…we have a washer, we have a tumble dryer which is oh so*

wonderful, oven, stove, refrigerator, television' (Interviewee 1, adult female)

'Oh, I need the washing machine. Well, it's up to me to clean all their stuff so I really need it. If I never had a machine, they'd be scrubbing their stuff theirselves (sic). So I really need it, really need it.' (Interviewee 5, adult female)

Here again we see their apparent acceptance of the socially reproductive role of women;thus, we can see the less than beneficial, invisible hand of governmentality as experienced by many women.

Male participants suggested reductions in the use of white appliances as a possibility. However, they also realized that if emissions reductions were required the people most affected, in terms of additional labour, would be the women, a recognition that was not evident in the secondary data examined above:

'Yeah, that's interesting in terms of the tallying effort that costs in life, my stuff is very much related to work, and so it would depend on whether the sacrifice needed to be made on that level or whether we were going to try to make it the level of the private household, in which case [my partner] would have to do everything …' (Interviewee 4, adult male)

While household technologies might be seen as havingfacilitated females' entry into the workplace, the areas in which that has happened almost always come to be regarded as deskilled and, as a result, disempowered (Fearfull, 1996; Fearfull & Kamenou, 2006; Haynes & Fearfull, 2008; Infestas Gil &Sanagustín Fons, 2004; Sanagustín Fons, 2008; Sanagustín Fons, Puyal Español, Moseñe Fierro, & Tricas Oliván, 2006; Tinker & Fearfull, 2007). Womeninterviewed for our study related the use of appliances tothe time spent on household tasks, including time saved while using appliances and therefore the possibilities of taking part in activities other than housekeeping:

> *'Sometimes relatives [who don't have a dishwasher] would say "that's a luxury why would you need that" but, in terms of time, if I'm trying to work as well and study, I just find it really useful and since we've got one it's hard for us to go back to just washing dishes by hand, but I think we did actually read somewhere that it's more economical in terms of hot water to use the dishwasher, so things like that…I think time, convenience, being able to do other things.'* (Interviewee 6, adult female)

In terms of the different distribution of household tasks, there was a situation that came from one set of interviewees where the woman was the sole wage earner and where the man found himself responsible for the household; he had clearly come to see controlling the footprint as part of that responsibility:

'…because I'm the only one that does it. [partner's name] has got enough to do with her job.' (Adult, male[19])

From this simple narrative we discern and recognize that household tasks are not distributed homogeneously, and that roles within the household domain are not consistent across families. It can be seen that this interviewee stood up to the mark of taking on the role of footprint control.

As considered above, the introduction of household technologies can be seen as something of a double-edged sword, raising productive expectations or even requirements of women, while diminishing the value placed on the work that they do, often simply because of the technological "input" to the work – and this outcome can be seen in both private and public domains. From a neo-Marxist (Labour Process) perspective, such a turn has been interpreted by some as suggesting enhanced alienation (Sturdy, 1992), from which we might extend to the concepts of self-discipline, the development of a technology of the self and "acquiescence" to a regime of governmentality.

Thus, we contend that the scenario outlined through the above narratives strengthens our contention that the calculator heightens awareness of genderedhousehold responsibilities;and responsibilities that were targeted by the calculator are those more readily associated with feminized household activities.

We have engaged with both secondary and primary data to present our argument that the tools developed to calculate carbon emissions, and to tie in those emissions with individuals. It has been our contention that such an approach is rooted in accounting technologies, themselves designed to render visible actions and individuals that would otherwise remain invisible. We have demonstrated how such invisibility might work against women in the battle to reduce carbon emissions, thus cutting them with a double-edged sword. Much of our analysis has demonstrated the capacity of calculator to rendering governable both men and women within society. We have extending from that to show the features of the calculator and associated technologies as capable of rendering people self-governing too. It has been our argument that women bear the heavier weight in this regard. We will now proceed to our conclusions.

6 Concluding remarks

This articlehasexaminedthe Act on CO_2 calculator, introduced in the UK as a means of tackling climate change by encouraging households to cut their emissions and minimize their 'carbon footprint'. We have engaged critically with the calculator and emission reduction advice, or technologies, through both 'official' and academic literature, secondary data and our own empirical work. Our analysis relates toone area of the UK context, so international generalisations are notinferred. Thus, futureresearch exploring this topic couldinvestigate different areas in the UK or contexts abroad.

Despite itsgeographical limitation, the calculator was a unique footprint calculatorcentral to UK policy on emissions control. Our critical engagement with the calculator is not to suggestthat we question the importance of the environmental benefits that could ensue from calculating carbon footprints. Rather it is to draw attention to the potentially domineering impact of the calculator on household lifestyles and perhaps particularly on the women within those households.Thus, our findings illuminate not only the accounting and gender relatedliterature, but also that addressing governmentality and policy development.

We used the concept of the‘governable person’ to explore the calculator as an accounting technology(Miller & O'Leary, 1987). We developed that notion further by incorporating literature from Foucault (Foucault, 1975, 2000) to engage with the notionsof the “disciplinary gaze” and the “biomass” respectively. Further literature integration drew us to suggest that women are uniquely affected by the dynamic between capitalism and patriarchy (Hartman, 1981), leading to their gendered bondage within their role in social reproduction (Laslett and Brenner, 1989).By synthesising the literature, and adding our own, new, empirical work, we have demonstrated how the Act on $C0_2$ calculator served to highlight that the main ‘shortcomings’ in regard to household emissions, were linked to the household technologies that women had most use of in fulfilling their role in privateproduction processes.

We found that the calculator providesa new language formaking visiblefootprint (inefficiencies) within the household context and that the manner of its mass communication is reminiscent of Thomson's (1990) theorisation that such approaches can be interpreted as delivering 'meaning in the service of power'. Thus, the use of calculator cannot be considered as neutral and its application suggests its capacity for control of householders' at distance.

We understand that households do not operate homogeneously. Our study illustrates that roles in the household context are not uniform. For example,roles can vary depending on paid activities household members develop. However, in a situation when a male was developing more tasks at private domain compared to public domain, the interviewee found himself profoundly responsible for managing household resources efficiently in both terms: economically and environmentally.

This study has shown thatis not only internal household dynamics but also political and economic contexts that influence individuals' decisions in regard to environmental policies. Reducing emissions as well as saving money were shown to be relevant information for individuals' decision making. Thus, the use of the calculator cannot be considered as neutral since its application suggests its capacity for control of householders at a distance.

The contribution of males in household production processes has increased over the last 60 years or so, however their participation remains minor in relation to that of

females (Lader, et al., 2006). In regard to the subject and objectives of our paper, the control of private emissions and its cost can be time consuming, requiring important changes in lifestyles(Walker, 2003). Through the techniques of analyzing such emissions, we contend that there is an opportunity to make visible gender-basedcontributions within household efforts to tackle emissions and save money. Thus, a stronger light might be cast on females' contributions in private and public domains alike(Walker, 2003).

Accounting is a practice that facilitates social construction. We are encouraged by our results and view them as making a contribution to this field of research whereby a greater degree of understanding of gender relations in the contexts of economic citizenship, governmentality, accountability and social reproduction - in both public and private domains - can be developed. Thus, we would argue, studies conducted from a critical perspective, have a crucial role to play in social research. In identifying some forms of controlling household efficiency and effectiveness in the context of our carbon footprint, we intend to conduct further research to deepen the examination of our argument. We urge colleagues too to engagefurther with the nature of control within and out with households as a means of attempting to ensure the development of a more complete picture, perhaps one that can be more supportive to women than we have seen so far. This would avoid overconcentration on the visibility of inefficiencies and allow social scientists tobetter provide accounts of the invisible contributions of women on environmental issuesin all contexts.

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Table 1- Interviewees' demographic information on anthropogenic climate change

CHARACTERISTICS[(i)]	PARTICIPANTS CONVINCED OF ANTHROPOGENIC CLIMATE CHANGE	PARTICIPANTS UNCONVINCED OF ANTHROPOGENIC CLIMATE CHANGE[(iii)]
AGE		
Less than17 years old	1	2
17-45 years old	4	0
46-56 years old	3	3
GENDER		
Male	4	3
Female	4	2
BACKGROUND		
Higher education[(ii)]	4	0
No higher education	4	5

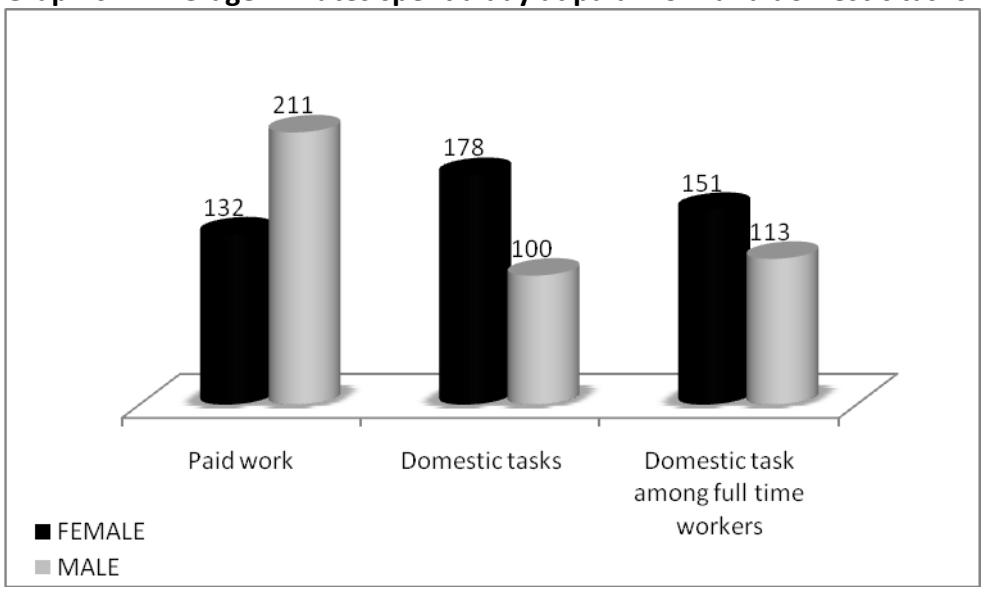
***Notes*:**

(i) Data collected before participants use the calculator. There was only one disable participant who found difficult to reduce emissions on transport (e.g. car use) but this particular person was extremely responsible while deciding car journeys and committed to reduce energy consumption.

(ii) This category of participants includes undergraduate student.

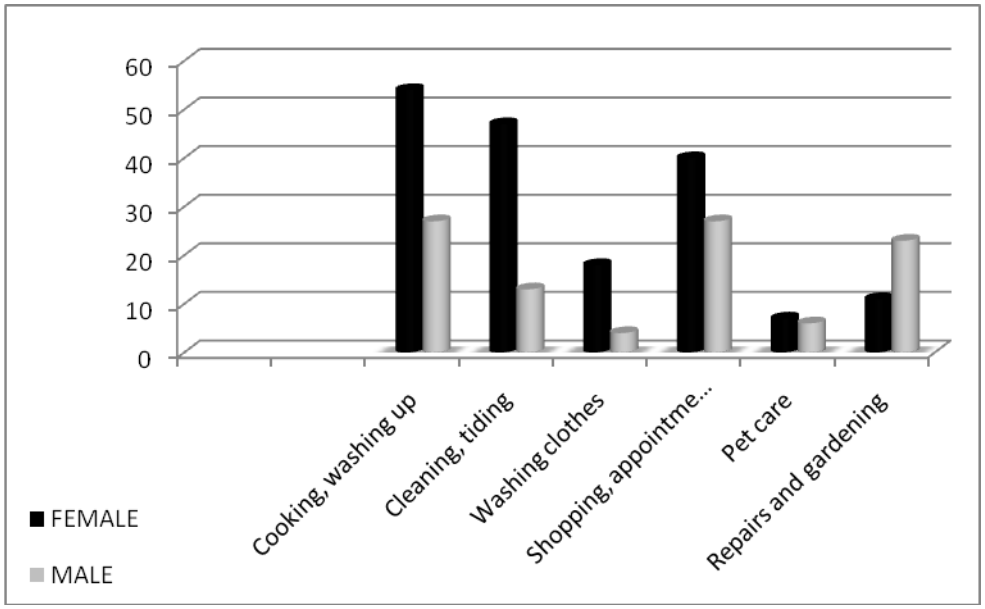
(iii)Five participants were not convinced of anthropogenic climate change (3 males: 2 females), being male participants more likely to take this position. Scepticism was identified within young adults and participants older than 45 years old but not in the age group between 17-45 years old. Discourse provided by sceptical participants showed that climate change is perceived to be 'handled very poorly' by scientists and politicians. Skeptical participants were also expecting more proactive approach from business. A sceptical participant observed household emissions were very small compared to businesses' impacts on environment and that any change at household level would represent a very little contribution to the overall emissions amount that is supposedly to be reduced around the world. However, despite scepticism on the anthropogenic underlying problem of climate change, sceptical participants were not resistant to engage with emissions reductions. These participants were interested in the calculator due to other reasons such as, save money and promote environmental cleanliness.

Graphic 1- Average minutes spent a day at paid work and domestic tasks



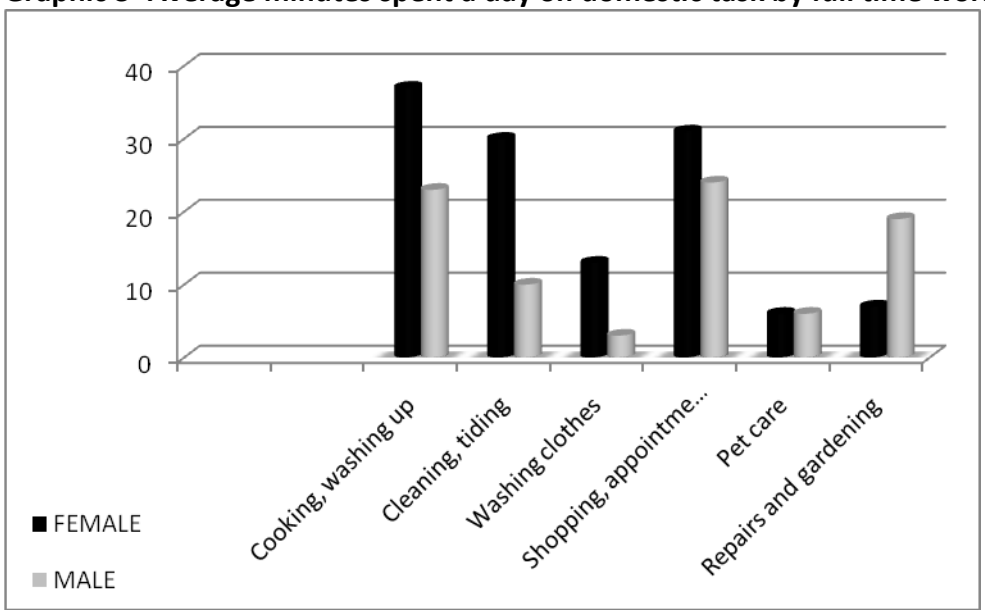
***Source*: Lader *et al*. (2006)**

Graphic 2- Average minutes spent a day on domestic tasks



***Source*: Lader *et al*. (2006)**

Graphic 3- Average minutes spent a day on domestic task by full time workers



***Source*: Lader *et al*. (2006)**

Table 2- People Power Challenge: Participants' characteristics

GENDER	AGE	PROFESSION
Male	59	Community Officer (works with people living with physical disability)
Male	40	Economic Development Manager
Female	55	Social Work Manager
Male	29	Occupation Administration Officer
Male	51	Security Guard
Female	56	Local Government Officer
Female	38	Marketing and Communications Officer
Female	32	Manager of the arts outreach and community development
Female	29	Project Manager
Male	53	Counsellor
Male	43	Company Director of a small retail business
Male	43	Community worker at The Avenues Community Education Project
Female	42	Founder and owner of a NGO
Female	42	Statistician
Female	39	IT Trainer
Male	39	Public affairs consultant and Councillor for Newcastle City Council
Male	44	Research Manager at University
Female	28	Test Technician for an IT company
Male	73	Chair of a group of elderly people
Male	47	Fine Artist
Female	33	Carer
Male	55	Health & Safety Advisor
Female	26	HR Consultant
Female	41	Part time freelance sponsorship/fundraising manager
Female	50	Privately employed speech and drama teacher
Female	47	Teacher
Female	37	Swimming Teacher and Masseuse
Male	56	Energy Efficiency Officer
Female	32	Teacher (on maternity leave)

***Source*:** http://campaigns.direct.gov.uk/actonco2/home/people-power/people-power.html

Table 3- People Power Challenge: Actions to reduce emissions

ACTIONS TO REDUCE EMISSIONS	MALE	FEMALE
Learn smarter driving techniques	8	12
Turn off appliances at the wall rather than leave them on standby	8	11
Insulation measures	8	10
Fit energy saving light bulbs	3	6
Turn thermostat down	4	5
Buy energy efficient appliances	0	3
Measure on thermostat equipment	4	2
Turn off lights in rooms not in use	2	2
Be more vigilant about boiling the kettle; only boil what I will use	1	1
Wash clothes at a lower temperature	4	0
Turn down the temperature of the hot water tank	2	0
Upgrade boiler	1	0
Use the car less for short journeys	1	0

***Source*: Analysis carried by the authors based on diaries available at:**http://campaigns.direct.gov.uk/actonco2/home/people-power/people-power.html

Table 4- People Power Challenge: Motivations to participate in this initiative

MOTIVATIONS	FEMALE		MALE	
	NUMBER OF PARTICIPANTS	%	NUMBER OF PARTICIPANTS	%
Economic reasons	1	6%	1	8%
Environmental responsibility	6	38%	10	77%
Economic and environmental reasons	9	56%	2	15%
Total participants	16	100%	13	100%

***Source*: Analysis carried by the authors based on diaries available at:**http://campaigns.direct.gov.uk/actonco2/home/people-power/people-power.html

NOTES

[1]The Act on CO_2 Campaign is no longer operating. However, detailed information on the Act on CO_2 calculator's data, methodology and assumptions can be found in DECC (2009). Additional information on the Act on CO_2 calculator (e.g. frequent answers and questions) can be also found at the National Archives on the following web-link (http://webarchive.nationalarchives.gov.uk/ 20090318060730/actonco2.direct. gov.uk/index.html).

[2]Data on this trial is available online via the UK National Archives webpage: (http://webarchive.nationalarchives.gov.uk/20090507165358/http://campaigns.direct.gov.uk/actonco2/home/people-power/people-power.html)

[3]Social reproduction is a term used to engage with people's activities within the private sphere. In essence, it involves any activity that people carry out for themselves or for their family and for which there is no payment involved. Most commonly, such activities could be typified as (female) gendered roles such as cleaning, cooking and raising children.

[4]http://www.measures-odyssee-mure.eu/public/mure_pdf/household/UK24.PDF

[5]http://webarchive.nationalarchives.gov.uk/20100623194820/; http://actonco2.direct.gov.uk/actonco2/home/about-us.html and http://www.parliamenttoday.com/free/viewnews.html?id=35249

[6]http://webarchive.nationalarchives.gov.uk/20100623194820/http://actonco2.direct.gov.uk/actonco2/home/about-us.html

[7]http://newsvote.bbc.co.uk/mpapps/pagetools/print/news.bbc.co.uk/1/hi/uk_politics/8571353.stm?ad=1

[8]The calculator won 'Best Use of Web Award' in 2008 and it achieved 1.7 million users between 20th June 2007 and end June 2009 (Owen & Beevor, 2009). The calculator was also praised as a 'well-designed graphic tool' (Bottrill, 2007), providing a level of transparency, assessment and comparison (Pett, 2009). There was a commissioned project by DEFRA to access the use of the calculator but results of this project were not available in public domain http://sciencesearch.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=15625

[9]A Bill is a proposal for a new law, or a proposal to change an existing law that is presented for debate before Parliament. Bills are introduced in either the House of Commons or House of Lords for examination, discussion and amendment (www.parliament.uk/about/how/laws/**bills**/).

[10]http://www.parliamenttoday.com/free/viewnews.html?id=35249

[11]http://www.parliamenttoday.com/free/viewnews.html?id=35249

[12] In this same survey, the percentage of men and women that use internet to find information about goods and services is very similar 69 and 64, respectively. Percentages also do not vary significantly between men and women for statistics on the use of internet to interact with public authorities. Thus, little can be inferred on whether or not ACT on CO_2 calculator was designed to target one specific gender group.

[13]https://www.newcastle.gov.uk/news-story/act-co2-campaign

[14]http://campaigns.direct.gov.uk/actonco2/home/people-power/people-power.html

[15]http://webarchive.nationalarchives.gov.uk/20100623194820/;
http://actonco2.direct.gov.uk/actonco2/home/about-us.html and
http://www.parliamenttoday.com/free/viewnews.html?id=35249

[16] Henceforth referred to as adolescents.

[17]"Saturation is the point in data collection when no new or relevant information emerges with respect to the newly constructed theory. Hence, a researcher looks at this as the point at which no more data need to be collected. When the theory appears to be robust, with no gaps or unexplained phenomena, saturation has been achieved and the resulting theory is more easily constructed." (Saumure and Given, 2008: 195-6)

[18]The sample selected does not include individuals in the age group above to 65 years old. The use of the calculator requires use of a computer and access to internet. According the Office for National Office, members of this age group are more likely to never had used computer before compared to other age groups so it would be difficult to access engagement of these individuals with anonline calculator (http://www.ons.gov.uk/ons/rel/rdit2/internet-access---households-and-individuals/index.html). It was evident from the families interviewed that class/background also had an impact on the use of technology (computer and internet). Some adults were unable to operate the calculator but young adults within the family had the ability to do so.

[19]This interviewee was not identified with ID in order to keep anonymity of his quotations over the text.